

solplan review

the independent journal of energy conservation, building science & construction practice

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Radiant Floor Heating



From the Editor . . .

Rules and regulations have been with us since the beginning of civilization. The taboos of a primitive tribe or the social rituals of our life can all be considered to be regulations. As we've become urbanized, we've developed ever more complex and elaborate rules. If you look at any society you will find a network of principles, instructions and restrictions guiding human activity.

As social creatures, it is simply not possible for everyone to do as they please, with no regard for others. That's why we've invented associations to which we adhere. On the broadest level these are the governments, on another it is the religious, professional, or social organizations or even the restrictive condominium societies to which so many belong voluntarily.

Some rules may be explicitly stated, others merely are followed as social custom ("it's the way we always do it"). All of these regulations and social restrictions have developed in order to set out appropriate limits to activity for the common good. Some deal with life safety concerns, such as the religious dietary rules developed to avoid problematic foods subject to spoilage and unhealthy toxins, such as the Jewish and Muslim prohibition against eating pork - a problem in the Middle East before refrigeration. The objective of these and many other religious or secular rules and regulations is to deal with concerns for the common good.

How does that relate to the building industry? The most significant regulations that impact us are codes and standards for buildings and building products. These have been undergoing many changes recently due to technological changes and changing public expectations. This has put pressure on industry and has generated a lot of thought about the fundamentals behind codes. Concerns have been raised that codes

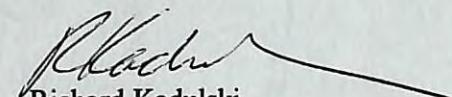
are becoming too unwieldy, all encompassing, and adding unnecessary cost to construction.

The intent behind codes is being questioned. Is it a basic structural safety regulation, or is it also to deal with other societal goals? I keep hearing a lot that codes should focus strictly on "health and safety" issues and not social goals, such as accessibility standards or energy conservation objectives. The feeling is that the marketplace should voluntarily decide how much further to go on these other issues.

Unfortunately, the public, our customers, has a totally different view of building codes. They think (and expect) that they represent a standard of good quality. Most are surprised to learn that the code is really a minimum standard, focusing mainly on narrow fire and structural safety concerns, and even they are not always adhered to.

Those that want basic "health and safety" considerations to be the governing considerations have to define what is meant by "health and safety". If you really want to deal with "health" and "safety", remember that it is very easy to justify many of the "extras" that are of concern today. Indeed, on health considerations alone you could justify the codes covering many additional issues not dealt with today. I think what many mean as health and safety is really minimum fire and structural safety issues.

It's time to identify clearly what concerns we consider are appropriate to be regulated. An effort must be also be made to include not just the industry but those most affected: our customers. After all, we may be biased and not fully represent what the "marketplace" really wants.


Richard Kadulski
Editor

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Heating Systems Fundamentals

In our climate even very energy efficient houses require some supplementary heat to maintain comfort. Unfortunately, we often forget that *comfort* and not just *heat* is what we are trying to achieve. We tend to think that all we need to do is to maintain a certain temperature. However, it's not that simple.

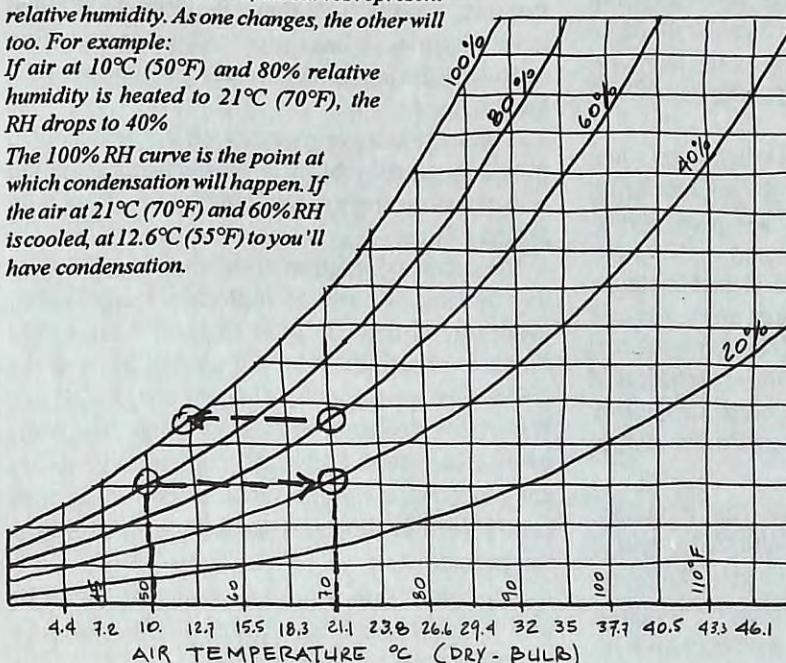
There are four factors that contribute to comfort: temperature, humidity, air movement, and surface temperatures. A comfortable environment is one in which the air temperature, humidity, air motion and mean radiant temperature are in an appropriate ratio to produce a sensation of comfort.

Temperature is a measure of heat intensity. Dry-bulb temperature, usually known as the air temperature, is the temperature taken with a thermometer not affected by contact with water or radiation.

Humidity is a measure of the amount of water vapour in the air relative to the amount that it could hold if the air was completely saturated. Humidity levels are dependent on air temperature, and very low or very high humidity levels are uncomfortable.

Air movement over skin evaporates moisture into the air, cooling the body. The rate of evaporation (and heat loss) is directly related to the

How to use a psychometric chart: Temperature is plotted across the bottom, the curves represent relative humidity. As one changes, the other will too. For example: If air at 10°C (50°F) and 80% relative humidity is heated to 21°C (70°F), the RH drops to 40%. The 100% RH curve is the point at which condensation will happen. If the air at 21°C (70°F) and 60% RH is cooled, at 12.6°C (55°F) to you'll have condensation.



rate of air movement. That is why in hot weather the first reaction is to search for a fan, to stimulate air movement. A poorly designed and balanced forced warm air heating system can lead to areas with large air flows, creating unwanted drafts.

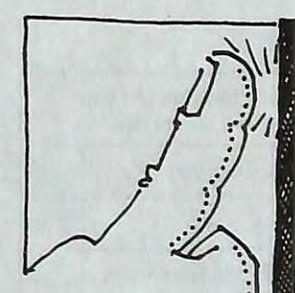
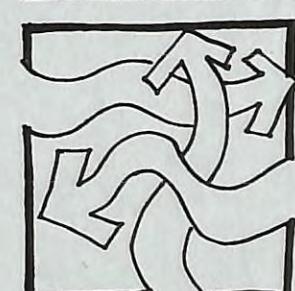
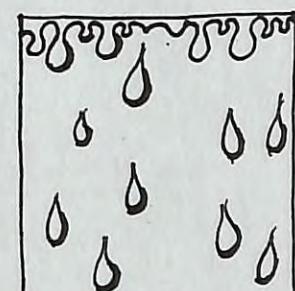
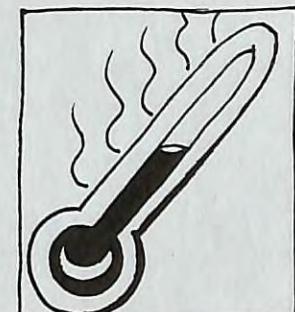
Surface temperatures (the *mean radiant temperature*) have a major impact on comfort. As warm elements radiate heat to cooler ones, the warm human body "sees" cold surfaces, so it will radiate heat to them, thus creating a cooling sensation. Drapes in front of large picture windows at night improve comfort by reducing the radiant heat loss, as the surface temperature of the fabric is warmer than the cold window surface so the body doesn't see the cold surface.

Heating registers and radiators are typically located against the outside wall, under windows - to heat the coolest part of the envelope, thus reducing the radiant heat loss, as well as reducing cold convective air currents washing down the wall.

Understanding the subtlety of these factors goes a long way to understanding the differing qualities of different heating systems. So when a salesperson is telling you their heating system is more efficient or better, it may well be from the point of view of one of these factors (but maybe at the expense of the others).

The mix is complex, as a change in one factor will affect another. This is why merely maintaining a set temperature will not ensure comfort.

The relationship between humidity and temperature can be plotted on the psychometric chart. It is used by mechanical designers to predict conditions at which condensation may take place especially when designing cooling systems, to anticipate and avoid condensation problems. It can also tell when condensation could be a problem in a cool basement in the summer, or on the fresh air intake ducts. ☀



Radiant Heating

Richard Kadulski

The most commonly used heating system in Canadian homes is forced warm air heating or baseboard heaters. However, there are other means to deliver space heating. In recent years, especially on the West coast, radiant heat has gained a significant market penetration - especially in slab-on-grade homes.

Radiant systems work by heating the entire surface (the entire floor or ceiling) rather than having a smaller higher temperature outlet (e.g. baseboard, radiator or air grille). Ceiling panels are typically electric resistance cables or foils (such as ESWA). In the case of floor radiant, it can be electric cables or hot water pipe coils. Usually these are embedded in a concrete mass - a 1½" concrete topping is typical on wood floors, or directly in the concrete of a concrete slab-on-grade.

Ceiling systems can be operated at surface temperatures up to 55°C (130°F), while floor systems are no hotter than 28°C (84°F) which is the limit based on foot comfort. Monitored results have shown that temperatures in radiant heated spaces are more even with less stratification between floor and ceiling.

However, there is a limit to the amount of heat that can be supplied. The upper limit for floor radiant is about 30 - 35 BTU per square foot, so a room with a large heat loss, such as a poorly insulated living room with a high vaulted ceiling and large wall of glass could be a problem. More heat can't be supplied by just raising the temperature of the floor surface as it will put the floor above the comfort level.

Finished flooring must also be considered when designing the system, as it can be an insulating cover and can restrict heat flow. R-values of various common floor finishes are noted in the chart.

Because radiant systems are closed systems, humidity is neither added nor taken away, so there is less of a drying effect than with forced warm air, although the RH is dependent in the airtightness of the house. As with other non forced air heating systems, a separate dedicated ventilation system is needed.

Sales people often will claim that a radiant system is substantially more "efficient" than a conventional forced warm air system. Unfortunately, this is a difficult claim to prove. It can in fact be shown that the warmer surface tempera-

tures on the walls can actually contribute to a greater heat loss simply because there is a greater temperature between inside and outside than if the surface is cooler.

Energy consumption for space heating depends on the construction characteristics of the house (its heat loss) and the way people operate their home. If the air temperature is kept lower, less energy will be used and there will be savings.

Radiant systems allow lower air temperatures to be maintained to provide an equivalent comfort level. Unfortunately most people don't understand this, so they keep their thermostats set to maintain air temperatures the same as if they had forced warm air heating. I've found that an average temperature of 19°C (66°F) can be quite comfortable - equivalent to comfort levels at an air temperature in a forced warm air heating situation of about 21-22°C (69-71°F).

It is important to recognize that floor radiant systems are not a quick response system. The thermal mass must be warm before it can heat a space, so essentially the systems are "on" all the time. In other words, if the owner goes away for the several weeks and turns down the heat, when they return and turn up the heat it will take several hours for the system to react, unlike a forced warm air system or wood stove that will respond fairly quickly.

The short term fluctuations that are a feature of many heating systems, and in poorly insulated houses, are not as likely to be seen with radiant systems, especially if there is adequate thermal mass. However, it has the potential of overheating especially during milder conditions in better insulated houses.

The heat storage capacity of the slab is also useful for areas subject to power outages, as the slab can store energy, retaining its heat for a long period of time.

The slower reaction time can contribute to overheating at times of high direct solar gains, especially if there is little thermal mass in the house to absorb the heat. Of course, because the slab will be warm, being "charged up", it will have less ability to absorb peak solar gains, thus overheating the space. Fortunately radiant systems are easy to zone, so proper zone layout along with careful control strategies can reduce the overheating problem.

For comfort, it is not just heat that has to be provided, but also fresh air, so a distributed ventilation strategy has to be incorporated.

R-value of Floor coverings	
maple (3/4")	0.9
oak (3/4")	0.78
3/8" urethane foam underlay	1.57
3/8" foam rubber underlay	0.67
1/4" jute	0.97
1/4" nylon plush carpet	1.12
wool plush	2.19

Legalett Air Heated Foundation

While most radiant systems use hot water or electric cables to deliver heat, other options are possible. The ancient Romans used to pump hot air under the floor in their baths to provide heat.

Scandinavian companies are marketing radiant heating systems that are designed as part of a whole building. Rather than using hydronic piping, they blow forced warm air through closed channels in the floor to provide space heating. Where needed, cool air can be circulated to provide summer cooling.

One system for slab-on-grade houses is being marketed by a Swedish company (Legalett) through a representative in Peterborough, Ontario. They claim to have installed over 40 million square feet in Scandinavia.

In contrast to other systems, the foundation and the heating system is designed as a whole system. A closed air duct system is cast into the foundation slab. The ducts are connected to a heating unit containing a thermostat-controlled heating element and a fan. The ducts, being a closed system, do not require cleaning or maintenance nor is there a limit to the life time of the duct system. Hot air is circulated in the ducts allowing the concrete slab to act as a large heat source.

Four inch spiral duct is assembled in the appropriate layout through the slab according to the design needs. A water or electrical fan coil is located in the heating unit (which remains accessible) placed in the concrete floor.

The unique aspect of the system is the construction of the slab. The slab-on-grade is laid on an 8" compacted gravel bed. The slab edge formwork uses Legalett's edge units which are 6" polystyrene blocks finished with cement rendering, giving an R-value at the edge of about R23. Insulation under the slab is 8" expanded polystyrene with interlocking block joints to provide an insulating value of R-35!

The high insulation level of the slab is not uncommon in Scandinavia, but it does raise eyebrows here, where we have not yet developed tools to adequately assess the performance of heated slabs, and some builders question the need for any insulation under heated slabs. One reason high insulation levels are used is to keep the floor temperature above the dew point, to avoid the possibility of any condensation taking place.

With a radiant heating system, when the concrete is placed, a temporary heater can be connected to the duct system thus providing an effective method to dry out the slab. The heater can be left in operation until the necessary drying-out has been achieved. This has advantages for the entire construction period as painting and installation of flooring can be carried out earlier than with conventional building methods, and traditional building heaters are not used. Propane heaters, so often used during construction, actually add to problems as the moisture generated by combustion is usually added to the structure, rather than being vented outdoors.

This kind of system is only appropriate for one level slab-on-grade houses. It requires re-thinking the need for basements which are not always needed, and which add substantial construction cost. Slab-on-grade designs offer the potential of affordable construction, and is a common practice in Scandinavia.

However, a Norwegian company has developed a system that uses conventional ribbed sheet metal to create an air cavity under a concrete topping, so that a radiant system can be used in multi story construction, providing each floor the opportunity of being heated and cooled with a radiant system.

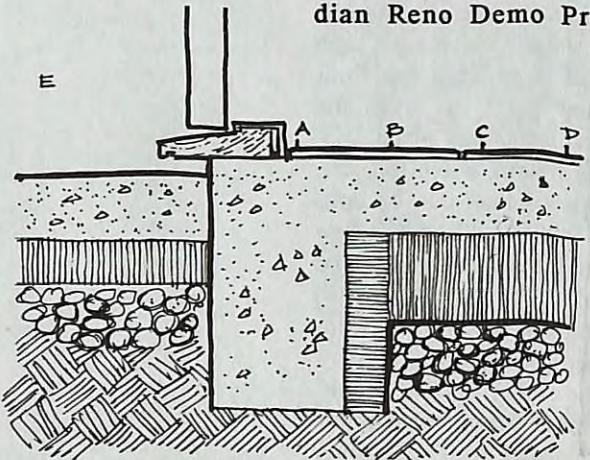
For information on the Legalett system, contact Eric Wallgren, in Peterborough, ON. at Tel: 905-660-5110; Fax: 905-660-1688.

Tired of the long cold winter?

Why not join the "Subtropical Russia Movement", a Russian fringe political party, dedicated to making Russia a warmer country. They have proposed legislation lowering the boiling temperature of water from 100°C to 50°C as a way of saving on electricity costs.

Radiant Heated Slab Performance Slab Edge Heat Losses

The radiant heated floor slab in the Great Canadian Reno Demo Project has been fully instrumented, and will be monitored for two years. Temperature probes have been placed in the slab and below, under the insulation. As well, several points in the ground outside are being measured. There are two zones, one on the south side with R20 rigid insulation under, and the north-



Door No. 1 No slab edge insulation

Average Temperatures (24 hr) (C)		
Point	Door No. 1	Door No. 2
A	12.39	14.23
B	17.09	17.99
C	20.96	20.27
D	23.56	22.24
E (out door)	-1.53	-2.63

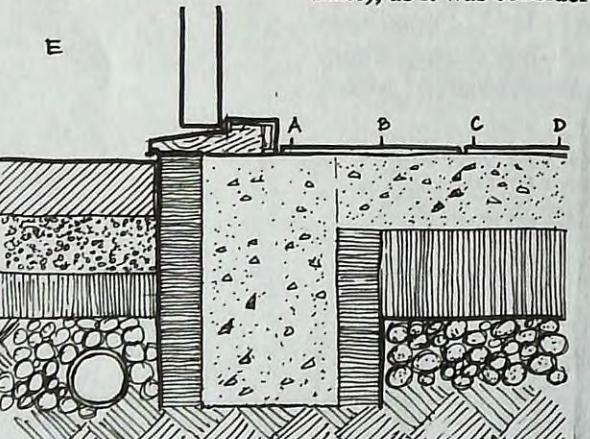
ern side with R12 rigid insulation under. Analysis of data gathered so far has not yet been done.

However, I observed that the edge of the floor was noticeably cool, so we measured the surface temperature of the floor (ceramic tile) adjacent to two exterior doors for a few days in January. Four points, 4 inches apart, were measured. The construction at each door is noted in the details.

The slab edge condition at door No. 1 is very similar to standard construction practices in the Vancouver area. Slab edge insulation was left out for a 6 foot section (it is at the front door to the suite), as it was considered too awkward to detail a thermal break.

The slab edge at door No. 2 is adjacent to a paving stone patio, and has 2" rigidfoam insulation on the exterior. The radiant heating pipes are kept back about 6" from the exterior wall (between points B & C).

Over a one day period, the 24 hour average slab temperature was 19.4°C and the room temperature averaged 18.6°C (65.4°F); with a maximum of 20.8°C and a minimum of 16.6°C. This may seem cool, but the space is actually quite comfortable. It



Door No. 2 Slab edge insulated on exterior

in fact underlines that it's not just the air temperature that is important for comfort. The variation in temperature comes about due to the 2°C setback setting on the thermostat (the coldest period was at 5:00 am).

The floor surface temperature at door No 2 (point A) with outside slab edge insulation, averaged 14.23°C. At the coldest period in the night, when exterior air temperature dropped to -7.6 °C, the surface temperature fell to 12.9°C.

The floor surface temperature at door No 1 (point A) with no slab edge insulation averaged 12.39°C. At the coldest period in the night, when exterior air temperature dropped to -2.2 °C it fell to 11.8°C. A manual calculation indicates that at an outdoor temperature of -7.6°C the temperature would be about 9.9°C.

The temperature difference between the two shows just how much of a difference insulation at the slab edge makes. Even if you are not concerned about energy consumption, you can appreciate that it will have a significant impact on comfort, and a potential health hazard, as the conditions could be suitable for condensation and mould growth.

What else did we find? A surprising surface temperature gradient at the floor perimeter: 8°C with the insulated slab edge, and 11°C where the slab edge is not insulated. (see table) You can be certain that an unheated slab would experience similar conditions.

The lesson? full slab edge insulation is very important. It may take some creativity to come up with workable details to address concerns for easy finishing of the exterior and the interior. However, it is important that we come up with such solutions. We welcome reader comments and suggestions for alternative means of providing that slab edge insulation easily, without adding unnecessary cost.

You may consider that this issue is not of concern to you if you don't build slab-on-grade houses. However, similar although not as dramatic, results will be found in basement floor slabs. After all, heat goes from hot to cold and the ground is still colder than heated indoor spaces. Further, there is no reason to automatically build full depth basements everywhere. Slab-on-grade construction is a very economical design approach suitable for every climate zone, so if you are truly looking for affordable housing options, consider doing away with basements. ☺

National Building Code of Canada 1995 Edition

extent to which Code users have become aware of how open the process is.

Every time a change is made, we tend to think that standards are getting tighter, leading to more cost. In fact, this is not always the case, as some regulations have become more lenient. Some changes were made to clear up parts of the Code that generated many requests for clarification, others to keep up with our growing understanding of building science. Changes were also needed to bring the Code up to date with a better understanding of such things as air and vapour barriers, combustion venting, indoor air quality and ventilation.

We present a selection of changes in Part 9 of the 1995 NBC.



National Building Code of Canada

research findings. This significant revision happened because of:

- 1) increases to the minimum sound transmission classification (STC) ratings required between residential suites from 45 to 50 and between suites and vertical shafts from 50 to 55 in the 1990 NBC; and
- 2) changes to the CSA Standard on Gypsum board which lowered the minimum density requirements for board and a revision to the definition of Type X gypsum wallboard.

The number of new assemblies included in the tables fill over 30 pages. However, the basic fire and sound resistance requirements have not been changed. It is only the information on the level of resistance provided by various construction assemblies that has been up-dated. The tables are provided in the Appendix and these values are for information only; other sources of information on ratings can also be used.

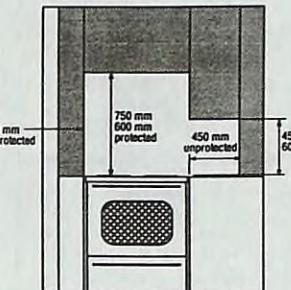
Siding

Vinyl siding can be used on walls built close to lot lines, where previously non-combustible cladding was required.

This is a relaxation of previous restrictions. Vinyl siding on exposing building faces of buildings other than houses is permitted where the limiting distance is at least 0.6 m and if there are no unprotected openings in the exposing building face. For houses vinyl is permitted where the limiting distance is less than 0.6 m.

New Fire and Sound Rating Tables

Sound transmission and fire-resistance rating tables for typical wall and floor assemblies have been changed and greatly expanded to reflect new



Spatial Separations

Calculation of openings in exposing building faces have been changed so that much larger windows can be installed in staggered or skewed walls built close to lot lines. Existing code requires that the limiting distance be taken as the distance measured at right angles from the closest portion of the wall to the lot line; all other portions of the wall are treated as if they were at this same limiting distance. The 1995 NBC allows each portion of a staggered wall to have its own limiting distance. This will allow much larger window areas in those sections of the wall stepped back from the property line.

Smoke Alarms

The code increases the number of required smoke alarms in a dwelling based on the number of storeys, the distance from an alarm to a bedroom door, and the distance between alarms. Smoke Alarms are now required inside each bedroom or within 5 m of the bedroom doors.

Clearance around Gas and Electric Ranges

New requirements specify horizontal clearances to wall framing and cabinetry; vertical clearances above the burners; and vertical clearances above the level of the burners within a certain horizontal distance of those burners.

Crawl Spaces

A crawl space must be considered to be heated or unheated. If it is unheated, it is outside the building envelope and it must be ventilated to the outdoors. The floor above the crawl space must incorporate insulation, a vapour barrier and an air barrier system.

If the crawlspace is heated, it is inside the building envelope and it must be treated in the same way as the rest of the building. Ground covers are prescribed to control both moisture and soil gas entry, and the walls of the crawl space must incorporate insulation, a vapour barrier and an air barrier system.

Attic Hatches

Attic access hatches in low attics are no longer required. Access is specified only where the space is at least 3 m² in area, at least 1 m in length or width, and not less than 600 mm high over this area.

Roof Space Venting

This section has been reorganized and the requirements made clearer, simpler and more flexible. Vents may be omitted completely where it can be demonstrated that they are not necessary. This addresses some factory-built buildings that have demonstrated acceptable performance.

For other buildings, research and experience indicates that venting is still required to remove moisture that is transferred from the heated spaces below due to imperfections in the ceiling air barrier system. A single requirement for the distribution of vents now applies in all cases and specifies not less than 25% at the top of the roof space, and not less than 25% at the bottom of the space.

Combustion Air for Fireplaces

A combustion air supply is no longer required for fireplaces. Research by CMHC indicates three interesting points about combustion air supply to fireplaces:

1. when the fire is at the full burn stage, it is such a powerful exhaust device that it will get all the combustion air it needs whether or not there is a combustion air intake.

2. when the fire is dying down, a 100 mm (4") intake does little to isolate the fireplace from the pressure regime of the house. This separation is needed to reduce the spillage of combustion gases from the fireplace being caused by another exhaust device depressurizing the house.

3. an air intake which enters directly into the fire chamber will, at some time, become a horizontal chimney when wind induces negative pressure at its outer end sucks products of combustion out of the fireplace.

Particleboard Subfloors

Particleboard subflooring installed in any area of the house may be subject to wetting (e.g. the wall-to-wall carpet when it is steam cleaned). As a result, water resistant treatment of all particleboard subflooring is required. However, underlay is no longer required between OSB subfloor and resilient flooring.

Loose-Fill Insulation

Until the 1995 Code, loose fill insulation was only permitted in horizontal assemblies and in walls of existing buildings. Now these products can be used in walls of new structures.

Polyethylene

The 1990 Code introduced the concept that the air barrier function and the vapour barrier function could be met by separate materials or systems. This allowed the use of the "airtight drywall approach" where the drywall serves as the prime component of the air barrier system and the paint acts as the vapour barrier. However, some people, including building officials, were nervous about relying on the paint, so many builders put in polyethylene anyway.

If the polyethylene is only acting as the vapour barrier and something else is performing the air barrier function, 6 mil polyethylene is no longer required when the poly is only performing the air barrier function and some other material or combination of materials is performing the air barrier function. Therefore, where this is the case, the polyethylene does not need to comply with the CGSB standard.

Shower in Lieu of Bathtub

The question as to whether bathtubs should be required by the Code or whether showers are an acceptable option has been discussed for many years. Showers are now permitted instead of bathtubs in dwelling units.

Anchorage of Water Heaters

A new requirement has been introduced to secure water heaters in seismic zones, 4, 5 and 6.

Mechanical Ventilation of Houses

The Code has included requirements for the mechanical ventilation of houses. However, the requirements were difficult for builders and inspectors to follow, so B.C. and Ontario have made significant changes to the original wording, expanding it to provide prescriptive options.

It was felt by many that the original requirements were inadequate, particularly as regards distribution of outdoor air brought into the house by the ventilation system, and preventing the ventilation system from depressurizing the house and thus interfering with venting of combustion appliances.

Every house must have a mechanical ventilation system (unless there is no electrical service to the building). Preferably that system should comply with CSA Standard F326, "Residential Mechanical Ventilation Requirements" or the pre-

scriptive alternatives described in Section 9.32. These alternatives are intended to provide performance approaching that provided by a system which complies with F326.

The total capacity of the ventilation system is based on 5 L/s (10 cfm) for each room, 10 L/s (20 cfm) for the first (master) bedroom.

The capacity of the principal exhaust fan must be at least 50% of the required total ventilation capacity, and the principal exhaust fan must at least have an on/off switch.

Each kitchen must have an exhaust fan of 50 L/s capacity and each bathroom must have an exhaust fan of 25 L/s capacity.

If the house includes any combustion appliance vented through a chimney, (e.g. B. vent or solid fuel appliance) then any exhaust device with a capacity greater than 75 L/s must be connected to a make up air supply fan so that, when the exhaust device is operated, it brings in enough air so that the net exhaust is reduced to 75 L/s.

Occupants will frequently turn off a house ventilation system if it provides too much ventilation and makes the house dry. The same is true if the ventilation system is too noisy, so the Code includes requirements for sound ratings for fans.

Combustible ducting can be used for distribution of ventilation air.

Minimum room and space dimensions have been eliminated.

National Building Code of Canada

Copies available in soft cover or binder format, as well as CD-ROM. For price information, etc: National Research Council of Canada, Institute for Research in Construction, Publication Sales, M-20 Ottawa, ON K1A 0R6 Tel: 1-800-672-7990 (Ottawa/Hull: 613-993-2463) Fax: 1-613-952-7673

The Span Book

Copies are available for \$ 12.00 plus GST, from the Canadian Wood Council,

Tel: 1-800-463-5091
Fax: 1-613-247-7856

Carpets and indoor air quality

Carpets have been singled out as a product that affects indoor air quality, due to direct emissions of volatile compounds from the fabric, dust, mites and other biological contaminants attracted to the carpet. People suffering from respiratory illness, such as asthmatics are especially sensitive to air quality.

The carpet industry is feeling the pressure and is beginning to circulate studies arguing that there is no problem with carpets. While there may be excessive hype and shrill voices against them, the carpet industry's studies do them a disservice.

Allergens and Asthma

Dust mites have an important role in both initiating asthma and in triggering wheezy attacks. Asthma is mainly an allergic reaction of the lungs to various airborne particles, of which the faeces of the house dust mite, whole or crushed, are by far the most important.

An allergen accumulation, no matter how large, is harmless to asthmatics unless and until it becomes airborne. When airborne, its availability to sufferers depends on how long it remains in the air.

The air within a building may become polluted by allergen puffing up from upholstery when people sit on it, or produced from bedding as the occupants sleep in it or make beds. In a carpet small amounts become airborne when people walk over it. This is especially a concern to children suffering from asthma, as children normally play on the floor, so they'd be constantly in contact with the highest concentration of dust as they roll around the floor. An air filtration system will remove large quantities of the dust, diluting any allergen that remains, but it depends how effective the filters are.

Dust Mites

Mites feed on the microscopic fragments of human skin which are found wherever people are. These bits of skin are too dry when they fall off the human body for the mites to use but the scales absorb moisture from the air, often helped by moulds growing on them. The result is a moister, softer skin scale, suitable for mite food.

The population levels of mites in carpets are normally controlled by the humidity in the building. In effect mites live in a desert inside a house

and they live under a constant threat of dying of thirst. The essential moisture they need is provided through their food.

In poorly ventilated humid dwellings large populations of mites can build up. Even in a house which is too dry for mites to live in the carpets, there will still be enough humidity in beds or in upholstery for the mites to grow, and for the inhabitants to suffer asthmatic attacks.

Dust mite faeces are brittle dry pellets, smaller than most pollen grains and capable of acquiring a static electric charge by friction (in which case it may become and remain airborne). It is very chemically stable and thus long-lasting. The accumulation of allergen in a carpet depends on a balance between the rate of production of it and the rate of removal. Production is slow and it can become significant when the carpets are insufficiently cleaned. The allergens can be removed from a carpet by proper cleaning.

Proper maintenance of a carpet prevents trouble but this means very thorough and frequent cleaning. But we have to recognize how people really behave. Most don't clean house daily, more likely on a weekly basis, if not less frequently. Many people, I suspect, use carpets simply because it hides a lot of dirt so that it can be cleaned only periodically.

Ordinary vacuum cleaners may pick up some allergens from carpets, but not all, especially if the bag is a standard one, it may not be an effective filter. Central vacuums located outside the main heated envelope are better, as there will be no blow back of particles not captured by the vacuum bag.

An English entomologist, in a paper for the British Carpet Industry¹, suggests that when using portable vacuum cleaners the homeowner "open the windows wide during vacuum cleaning and for a little while after". This, presumably, will ventilate the house and blow away the allergen. We know that opening windows does not provide any guarantee of ventilation, and when it's -30 no sane person is going to open their windows wide!

(The same paper, addressing concerns raised about use of carpets for people with asthma, states "some people actually seem to take pleasure in advocating puritanical measures for asthmatics").

*'Carpets, House Dust Mites and Asthma
Dr. John W Maunder
Director, Medical Entomology at the University of Cambridge'*

Effects of carpet emissions on indoor air quality.

Carpets are a source of low level volatile organic compound (VOC) emissions. The quantity is variable, depending on the nature of carpet and products out of which it is made. For most materials, emissions will decline to stable low levels fairly soon after the carpet is installed.

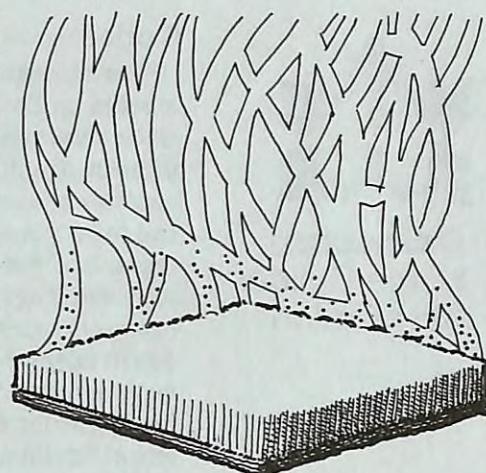
While the carpet industry rejects claims that emissions are a problem, field research on the effects of new carpets on both indoor air quality and symptoms is generally incomplete. Even a study done for the Carpet and Rug Institute at Cornell University¹ points out there is a lack of detailed information on possible effects for many of the VOC's present in carpets (e.g. 4-PC). Testing is available for some of the dominant VOCs; but not for the mixture of emissions found in carpets.

No definitive toxicity assessments are available and human challenge testing of carpet in climatic chambers has not been done. Sensory and pulmonary irritation problems do not occur in animals exposed to carpet emissions under normal testing conditions, but in exceptional circumstances irritation effects have been seen. Individual reactions to emissions from new carpet may depend on the personal tolerance level of individuals, which can vary.

Emissions from some carpets are sufficiently low so that carpet compares favourably with other indoor products. Emissions typically will decay to stable levels soon after installation.

Perhaps most disturbing in a "scientific" research paper (prepared for the carpet industry) is the statement, a conclusion in the report, that "some MCS (multiple chemical sensitivity) cases, and perhaps a majority, shows signs of psychiatric illness or psychological abnormality."

With that kind of attitude, can one believe the researchers?



*'Effects of new Carpet Emissions on indoor air quality and human health Report prepared for:
The Carpet and Rug Institute by Alan Hedge
Rodney R Dietert
Institute for Comparative Environmental Toxicology, Cornell University'*

Indoor Air Quality Program for Carpet

To deal with concerns about indoor air quality, and more specifically about pollution from carpet products, the Canadian Carpet Institute has established a voluntary labelling program for carpets. Carpet product types that have been tested for VOCs, which do not exceed the established emission levels, will be identified with a CCI/CRI Indoor Air Quality Program label. The label will be affixed to carpet samples in retail showrooms and in a manufacturer's literature.

What are the program requirements?

The program requires carpet to be tested for volatile chemicals which could be released into the air. The maximum allowable emission levels are noted in the table.

Formaldehyde has not been used in the manufacture of carpets for many years, but carpet can

absorb it from other sources in the environment (such as smoke, household furnishings, cleaners, etc). 4-PC (4-Phenylcyclohexene) is a major constituent in the "new rug" smell. It comes from the latex backing used on many carpets.

Testing for the program is conducted by an independent third party laboratory. Under the program, products must be periodically retested to ensure that the established emission levels are not being exceeded. If a manufacturer's test fails, changes have to be made, and the manufacturer's products will be tested more frequently in the future.

CRI supports the program at the consumer level as well as with a consumer phone line (800-882-8846)



Compound	Allowable emission level (mg/m ² .hr)
TVOC	0.5
Formaldehyde	0.05
4-PC	0.1
Styrene	0.4

Technical Research Committee News



**Canadian
Home Builders'
Association**

Codes

The Strategic Plan issued by Canadian Commission on Building and Fire Codes (CCBFC) recommends that work proceed with the development of objective-based codes. Objective based codes allow more flexibility than a rigid prescriptive code, merely stating the desired object of the regulation. For example, the requirement may read "*buildings shall be provided with safeguards against fire spread so that occupants have time to escape to a place of safety without being overcome by the effects of fire*" followed by a statement how the performance will be verified. A document along the lines of the current code would be available to provide a statement of an acceptable prescriptive solution, but it would not be the only way to meet the code.

Another key element in the plan was the decision that there should be a separate code for houses. This will probably mean that Part Nine will disappear. All requirements for single detached, semi-detached and row houses would appear in a separate code for houses, and all other buildings currently covered under Part Nine would have to comply with Part Three.

A separate code for houses will not be ready until the next code cycle, in the year 2000.

Illustrated Housing Code

NRC, under contract with the Ontario New Home Warranty Program, will be publishing a National Housing Code of Canada Illustrated Guide early in 1997, based on a similar format to the Ontario Code and Construction Guide.

Chimney failures

Carbon Monoxide Sensor Problems

Public awareness of chimney problems is very high in Saskatchewan because of several fatalities in the Saskatoon area. Inspection companies are finding hundreds of failed type A chimneys and damaged masonry chimneys. Perhaps this would be an opportunity for local renovator councils to gain exposure, by doing public service announcements about the need for preventive maintenance to maintain a safe and healthy home.

Many residents have installed carbon monoxide (CO) detectors to help warn of danger from this deadly gas. However, CO detectors are now giving

many false alarms, either because the detectors are not working properly or the houses are experiencing higher levels of CO than generally expected.

In many cases the alarms are going off because the battery is low or no longer works. Some calls come in from homes where people warm their cars up in attached garages and the gas seeps into the house. Others came from accumulations of low levels of the gas that was detected over time.

What is not well known is that CO detectors are different than smoke detectors. They have to be maintained and calibrated regularly in order to function properly.

Ontario Building Code Review

The Ontario Ministry of Municipal Affairs and Housing has issued a "Back to Basics", discussion paper. It describes the ministry's intent to change the focus of the code to a more basic health and safety orientation. The Ontario Home Builders (OHBA) has prepared a paper in response outlining 3 suggested principles to guide the development of the Ontario Building Code. These should be:

1. market forces are preferred over regulations
2. the code should provide opportunity for product diversity
3. changes should be justified by a cost benefit analysis.

The OHBA supports a separate Ontario code, rather than using the National Building code.

Plastic Venting

Class Action Suit Started

The Ontario New Home Warranty Program (ONHWP) has launched a class action on behalf of the estimated 10,000 Ontario homeowners who have mid-efficiency furnaces with defective high temperature plastic venting systems. The goal of the class action is to recover costs involved in correcting the hazardous problem and ensuring their safety.

On certain mid-efficiency natural gas furnace, the high-temperature plastic venting systems are prone to premature failure due to cracked pipes or fittings, or loosened joints, which in turn may result in harmful exposure to carbon monoxide from the furnace exhaust.

Defendants named include the three U.S. manu-

facturers of the high temperature plastic venting systems, the 13 mid-efficiency furnace manufacturers, the Underwriters' Laboratories of Canada and Underwriters' Laboratories Inc., the two approval agencies who authorized the use of high temperature plastic venting systems in Ontario.

New home builders who have incurred direct costs associated with replacing the defective systems may be able to recover some or all of their costs as a result of the class action. In addition to replacement costs, eligible direct costs may include the purchase of CO detectors, taping and inspections.

Questions about ONHWP's policy or if you have installed high temperature plastic venting in any of your homes, contact Dennis Faubert, toll free at 1-800-387-7861. All defective venting systems must be corrected by August 31, 1996.

For more information about the class action, contact Siskind, Cromarty, Ivey & Dowler, toll free at 1-800-461-6166.

EIFS

(Exterior Insulated Finishing Systems)

A class action law suit has been started in the United States against the major manufacturers of EIFS products: Dryvit Systems Inc; Sto Corporation; Shield Industries, Inc. and Parex, Inc.

The action charges that the manufacturers of EIFS suppressed the dissemination of information regarding the siding's vulnerability to moisture and prevented the homeowners from having knowledge of these latent defects. The suit also charges fraud, misrepresentation, breach of expressed warranty, breach of implied warranties and false advertising.

It is claimed that EIFS, as designed and manufactured, is defective in that, among other problems, they have no building paper and/or drainage mechanism normally found in walls, so that when exposed to moisture under normal weather conditions, water is trapped between the synthetic stucco facade and the structural members and interior finishes of the walls, causing wood to rot and decay and steel to corrode and promoting mould growth and insect infestation.

Defects are not normally detectable to exterior inspection until there is major structural failure.

Costs/Benefits to Municipalities of Mandatory Residential Fire Sprinklers

A study is currently underway to assess, on impartial, technically-justified economic grounds, the costs and benefits to municipalities of the mandatory installation of fire sprinklers in all new residential construction. This study is trying to identify the consequences of possible changes to municipal infrastructure, insurance and fire department operations.

The sprinkler lobby claims that introduction of mandatory residential sprinklers could result in significant cost savings to the municipality are being assessed. In addition, the benefits and risks of automatic sprinklers are being reviewed, and estimates of the effect on construction costs of housing and the effect on service and maintenance costs are being made.

A case study approach has been employed, using Barrie and Burlington, Ontario as representative case study sites.

A significant factor identified is that there are many non-fire related emergency services provided by some fire departments. This means factors other than fire services often control the design of the municipal infrastructure, so that there are no cost savings projected to be achieved from this area.

The final report is due later this year.

Flooring problems: Telegraphing of Underlays

Joints in underlays that telescope through finished flooring have been causing problems for some builders. Work to identify the cause for the problems is still underway. The study is trying to find definite solutions to the problem. Anyone who's had a problem is still encouraged to contact Ross Monsour at the TRC with details of their problem.

Specific information is needed: which materials caused the problems, including product specifications (manufacturer, application details, etc.) for both finish flooring and sub-floor products.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. If you have any problems, technical questions, or suggestions for areas that need to be investigated, you are encouraged to contact your local Home Builders' Association technical committee or the TRC directly at: Canadian Home Builders' Association, Suite 200, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4 Tel: (613) 230-3060 Fax: (613) 232-8214



R-2000 Program News

For Information on the R-2000 Program, contact your local program office, or call

1-800-387-2000

Canmore's Jewel Community Project

The Town of Canmore, Alberta has entered into a partnership with the Alberta Home Builders' Association R-2000 Program to plan and deliver a "Jewel Community Demonstration Project". The Jewel community concept is designed to help municipalities work toward building sustainable residential developments.

Many R-2000 home features are of interest to municipalities as R-2000 homes can reduce the load on water filtration facilities, sewage treatment plants and landfill sites. Homes that use less water give municipalities the benefit of a reduced demand for both water filtration and sewage treatment services.

In an era of tight budgets, where many municipalities have existing facilities operating at or near capacity, the possibility of delaying multi-million dollar infrastructure expansion is a good reason to encourage all new homes to be built to the R-2000 standard. When entire subdivisions are designated R-2000, additional savings can be achieved through smaller water and sewer piping infrastructure. Through the R-2000 materials conservation re-

quirements, the amount of waste generated can also be significantly reduced, a further benefit accruing directly to a municipality.

A subdivision of 25 - 30 certified R-2000 homes is being planned in Canmore. A task force is being established to define the parameters of the project, which will consider:

- affordability
- resource - and environment-saving features
- recruitment of other potential stakeholders.
- timelines for planning and construction
- final site selection and preparation of guidelines
- assessment of environmental impact on the municipality.

On Oct 13, 1995, the Mayor of Canmore, Bertram Dyck and John Drake, President of AHBA signed the partnership agreement as a first step toward creating Canada's first "Jewel Community". The Canmore project may start a process that can be repeated by other communities across the country. ☺

BC R-2000 Program

The program has been struggling in BC. The lack of support from the provincial government and BC energy utilities has had a direct effect on the Program's ability to penetrate the market. A financial crunch at CHBA-BC, which has been administering the program in the province, has led CHBA-BC to cease delivering the program.

Ironically the week that the decision to cease program delivery was made, CHBA-BC received many calls from prospective home owners inquiring about R-2000 program.

The R-2000 Program in B.C. is still alive. BC Builders are encouraged to take advantage of the good will and interest of home buyers for R-2000,

and use it to their advantage, as houses can still be built and certified.

For the time being CHBA (national office) together with NRCan will take over as many of the administrative functions as practical. A system of R-2000 file managers is being set up. This will mean that a local person will handle all the paperwork required for registration and certification of a house. Once all the documentation is in order, the file manager will be forward it to Ottawa for certification. File managers may handle any or all of the quality assurance steps required: design evaluation, inspections, and air-tightness test. ☺

R-2000 and Youth/New Brunswick

The R-2000 standard of building construction is being used by the Fredericton Home Builders' Association in the construction of a Youth in Transition Home. Volunteer effort by the Fredericton local will provide street kids with a

home that gives better indoor air quality, comfort and high standards of construction. The home, which will be certified R-2000, will house up to 8 youth and 2 guardians.

Everyone benefits from a healthy indoor environment. Many factors contribute to the quality of indoor air: outdoor air, building materials and furnishings, occupants' activities, materials used to maintain the home, and the heating and ventilating systems.

A small group of people, referred to as environmentally hypersensitive, experience serious health problems when exposed to even very low levels of contaminants. For these people superior air quality is critical to their well being.

People interested in building homes with a healthier indoor environment or to meet the needs of hypersensitive individuals often have difficulty identifying appropriate building materials, as this is a newly identified, fast evolving area of concern. Information is often unavailable, inaccurate, incomplete, or out of date. CMHC has just published *Building Materials for the Environmentally Hypersensitive*.

This guide will be a valuable resource to anyone wanting to select healthier materials.

How Do Building Materials Affect People?

Important factors in the health effects of materials are emissions, toxicity, quantities and proximity to people. These can't be considered separately and usually more than one factor is at work.

Emissions Some materials have higher emission characteristics than others. For example, paints or finishes are likely to have higher emissions than window glass or ceramic finishes. As a rule, emissions increase as the temperature is increased.

Toxicity Materials that have a few or no harmful effects on people are considered to have low toxicity. The toxic effects can be acute (immediate) or chronic (long term). Some pollutants, such as lead, radon or asbestos, manifest their effects from long-term exposure, while most airborne pollutants found in homes exert their effects from short-term exposure.

Quantity Some materials are used in greater quantities than others. Walls, floors and ceiling make up the largest proportion of surfaces in a house and large quantities of materials are used to cover these surfaces. Low emissions from large quantities of materials can still result in high total amounts of chemicals in the air. When materials with significant emissions are used, their effects on indoor air quality can be substantial.

Healthy Building Materials

CMHC SCHL
Helping in Better Construction

BUILDING MATERIALS
FOR THE ENVIRONMENTALLY
HYPERSENSITIVE



Proximity Materials inside the home are more likely to affect occupants than materials outside the living space.

How to improve indoor air quality.

The first step is to reduce or better still eliminate the source of pollutants by substituting materials with the lowest possible emission level.

The next step is to separate problem materials from the living space, so that they will not cause problems for the residents. This would be done by an air barrier, or using an acceptable sealer.

The final step would be to ventilate with mechanical systems designed to remove pollutants and provide fresh air for the occupants.

In practical terms, this would mean using the following materials and features when building or renovating:

- wood products that do not emit formaldehyde
- low-toxicity, water-based interior finishes.
- hard-finish flooring (e.g. ceramic tiles or hardwood)
- low-tox installation and finishing products
- house location that avoids traffic and industrial pollution
- modern building techniques and systems to reduce contaminants from the outdoors and positively ventilate the indoor environment.
- a well drained, finished basement, or better yet, no basement at all
- a low-temperature heating system. If solid fuel is used, the combustion appliance should be located in a space sealed off from the lived-in area.
- ventilated closets or closets separated from bedrooms
- an air purification system
- a central vacuum system exhausted outdoors.

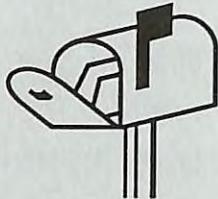
Building Materials for the Environmentally Hypersensitive includes product sheets that give general information about building material including: common product names, (including brand names when appropriate); typical uses; special properties; health issues; components of the material; and product sources.

Valuable supplementary information about each product class is provided through comments on the experience of people with environmental hypersensitivities. ☺

Building Materials for the Environmentally Hypersensitive
published by CMHC
and is available for
\$29.95.

Tel: 1-800-668-CMHC
Fax: 1-800-463-3583

Letter to the Editor



Re Editor's comments (Solplan Review, January 1996)

You are absolutely correct. The home building industry today is over regulated and yes, we do cringe at the thought of new code changes and new regulations that will add substantial costs to new home construction.

The 1995 N.B.C. has some 450 changes, most designed to make housing less affordable. We have been told Building Standards Branch in Victoria have received an additional 200 code proposals that if adopted in the B.C. edition, will again increase the cost of new homes.

Yes, we must be sensitive to our environment, but at the same time we must balance the social objectives of providing affordable market housing for the generations to come.

I agree totally that "minimum" energy related regulations are positive and worthy of implementation and in fact we have already achieved this goal. Since 1989 we have sealed our homes, installed polypans at exterior fixtures, double glazed windows with energy efficient frames, and in 1992 included "minimum" allowable insulation levels for all homes built in B.C.

Subsequently, in 1994 the insulation levels were increased beyond minimums without justifying the payback and we are now installing insulation levels in some parts of British Columbia that are excessive.

If the National Energy Code for houses was a document that did in fact address minimum energy regulations, as you suggest, in a cost efficient manner, of course it would receive the full endorsement of this industry. Unfortunately this is

not the case. The proposed code is simply a vehicle to add more gold plating, more work for designers and more work for bureaucrats.

Surely, going into the 21st century we can strike a balance for housing affordability and at the same time be sensitive to the environment.

The proposed National Energy Code for housing does not meet that goal.

Neil M Ziola
Sure-Lok Homes Ltd
Langley, B.C.

It is unfortunate that my editorial comments were misunderstood.

I was expressing concerns that the development industry is not supporting voluntary industry initiatives to promote energy conservation, and more specifically is not allowing the installation of solar systems.

The arguments I hear industry make against energy codes is that it is not something that needs to be regulated; that the market place should decide how far to go. If that is the position, then it should encourage voluntary applications that go beyond basic minimums. What I encountered (and not for the first time) was a case where "the market place" was explicitly forbidden to take advantage of solar energy.

To avoid the need for regulations, industry has to be pro-active and encourage alternatives to minimum standards, and celebrate them - not say "thou shalt not". It is the attitude shown by that developer that is fuelling the demands for actions (such as energy codes) that industry says are not needed. Ed.

Oops!

We omitted to give credit where credit is due. In Solplan Review No. 66 we neglected to mention that the study testing the reduction of formaldehyde emissions by various points was done by Don Figley and Jerry Makohaon and was presented at the Air and Waste Management Association Annual meeting in Denver, CO.

Our story on thermal bridging through framing (p7, Solplan Review No. 66, January 1996) contained a typo in the temperature table. The temperature in the roof, for a 16" deep wood I joist at point D should read as +20.4°C (not minus).

Public Attitudes to Energy Conservation

Who says energy and environmental issues have a low priority? A nation-wide telephone survey by The Angus Reid Group among recent and prospective home buyers found that support for minimum energy efficiency standards is clear.

When recent and prospective home buyers were asked about the energy efficiency of new homes being built in Canada today, only 28% believed that a lot of new homes being built today are energy efficient, while 37% believe that a lot of new homes built today are not energy efficient. The rest were not certain. As the age of respondents increased so did their level of scepticism about the energy of new homes being built today.

A more recent survey done for the Royal Bank indicated that Canadians see community safety as the most important factor when looking for a home, closely followed by energy efficiency and environmentally friendly construction then proximity to parks and open spaces, and low taxes. Being close to shops and restaurants was rated lowest among 11 factors.

New home buyers were more satisfied with the overall comfort levels of their homes than resale home buyers, presumably reflecting higher standards of new construction.

What do people expect to find in an energy efficient home?

Top on the list is an energy efficient heating system, followed by good insulation and well sealed doors and windows that keep out drafts. Other features mentioned were good ventilation, energy efficient lights and appliances, and solar panels.

The vast majority agreed that it may be important to pay extra for energy conserving products.

However, home buyers want to recoup investments in energy efficient features over a relatively short period of time. Just over half of those surveyed (56%) estimate that the cost of energy efficient features in an average home are paid back in under 5 years.

The survey shows that any efforts to have minimum standards for all new homes built in Canada would be supported by the overwhelming majority. There was a bit less support among first time home buyers than those who had previously owned a home. The more comfortable people are with the subject of energy efficiency, the more likely they are to support minimum standards.

The home buying public saw a role for government to play in the implementation of minimum energy efficiency standards, wanting government to take an active role in legislating standards. Only 30% of respondents agreed that, "market forces should decide the standards for energy efficiency in new homes rather than making them a requirement".

An analysis of the demographic data indicates that as the household income and education levels of respondents increased so did their desire to see government rather than market forces decide the standards for energy efficiency in new homes.

On the basis of evidence like this, the debate about legislated minimum standards is going to continue.

It is interesting to note that while we are having a raging debate in Canada about the implementation of an energy code for the first time, most U.S. States have already adopted Energy standards. ☺

REDI 96™ updated product database

REDI 96 the database is also available in hardcopy (book) for \$49 or as a computer database on disk (\$49)

Tel: 503-484-9353
Fax: 503-484-1645

free on the Internet:
<http://irisinc.com/oikos/>

Iris Communications has released REDI 96™ an updated product database that simplifies the search for green building products (i.e. recycled building material) and for products that increase energy efficiency. REDI 96™ combines the REDI Guide™ and the Energy Source Directory™.

It identifies companies that offer products with these environmental benefits: recycled content, energy and water saving, low toxicity and indoor air quality.

SAM Award for the Great Canadian Reno-Demo Project!

The 1995 SAM Home Renovation Award (\$25-100,000 Renovation) was presented to Harald Koehn of Koehn Construction of Vancouver, B.C. This is one of a series of national awards presented during the CHBA Convention in Vancouver last February.

The Great Canadian Reno-Demo Project is the renovation of an older North Vancouver house that demonstrates environmentally responsible, energy efficient and healthy home approaches to home renovations. We've described the progress of the work on this project over that past year.

Web sites of interest

CHBA is going on the web. April 1 is the launch date for its home page, located at

<http://www.chba.ca>

Association news, including committee news will be posted, as well as any other information on interest to the building community.

Canadian Wood Council is on the net at

<http://www.cwc.ca>

Through the CWC Home Page you can survey and order publications, download and run software demos, make technical enquiries.



design & consulting
energy efficient building
consulting services
R-2000 File Manager
HOT-2000 analysis

Richard Kadulski Architect

#208 - 1280 Seymour St.
Vancouver, B.C. V6B 3N9
Tel: (604) 689-1841
Fax: (604) 689-1841

Flue Vent Retrofits

A new vent system has been developed that promises to provide an answer to the plastic side wall venting problems.

The product, called the MID-VENT, is a glass lined 16 gauge steel pipe (3" and 4" diameter). The pipe comes in a range of lengths, and uses a special gasket and mechanical joint coupling detail. All materials are temperature and corrosion resistant.

An interesting feature is a tester that can detect a flaw in the flue, so that any crack, pit or pinhole present in the assembly will be picked up.

The vent is undergoing testing now, with ULC certifications expected to be completed in May 1996.

For details:

Mid Vent, Markham, ON

Tel: 905-474-0533

Fax: 905-474-1523

High-Rise Residential Construction Guide

"Build it right the first time" is the essential ingredient to success no matter what type of building. Improved design and building practices enhance consumer satisfaction and improve builder/vendor profitability.

The *High-Rise Residential Construction Guide* prepared by the Ontario New Home Warranty Program (ONHWP) has been revised to reflect the realities of designing and building high-rise condominium projects in the 1990's. The Guide is not a "how-to" Manual, but integrates technical information with the Warranty Program's high-rise design and field review reporting requirements set out in on Builder Bulletin 19. ONHWP's design and field reviews focus on issues that generate repeated complaints and building envelope problems.

The Guide offers practical solutions to frequent and costly defects and will benefit builders and designers of all high-rise buildings. It offers new information on pre-cast concrete, rain screen, window wall, Exterior Insulation and Finish Systems (EIFS) and alternative wall systems.

Copies are \$59.00 and are available from the Ontario New Home Warranty Program Client & Technical Services Department Tel: (416) 229-3807 or 1-800-668-0124 Fax: (416) 229-3845

Coming Events

June 9-12, 1996

3rd annual Canada/Japan Housing R&D Workshop Ottawa, ON Information: Darinka Tolot, Tel 613-943-2259, Fax 613-996-9416

June 9-12, 1996

A Sustainable Energy Future: How do we get there from here? Annual conference sponsored by the Solar Energy Society of Canada. Orillia, On. Information: Tel 613-523-0974, Fax 613-736-8938

June 25-25, 1996

Green Building Materials '96 A forum for manufacturers, specifiers, architects and builders. Technical presentations as well as product displays and discussion forums focusing on "green" products (and what it may mean). For detailed information, contact:

Dr. Charles Kibert, Centre for Construction and Environment, University of Florida, Gainesville, FL. Tel 904-392-7502; Fax 904-392-9606.

17 - 20 September, 1996

17th AIVC Annual Conference "Optimum Ventilation and Air Flow in Buildings", Gothenburg, Sweden. Contact: Rhona Vickers, AIVC, Sovereign Court, Univ of Warwick Science Park, Coventry CV4 7EZ, England
Tel: +44 (0) 1203 692050
Fax: +44 (0) 1203 416306

April 17, 1996.

Workshop on Home Energy and Environmental Management Systems "Home energy and Environmental Management Systems" products or systems which include some form of electronics, controls, software, automation and/or intelligence — designed to improve the energy efficiency and indoor environment of a home through the intelligent management, control or automation of traditional home systems (such as HVAC systems, appliances, etc.)."

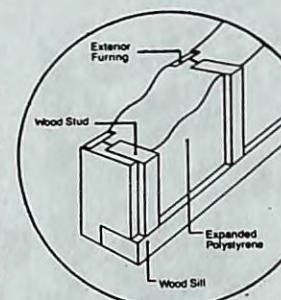
Montreal, Quebec
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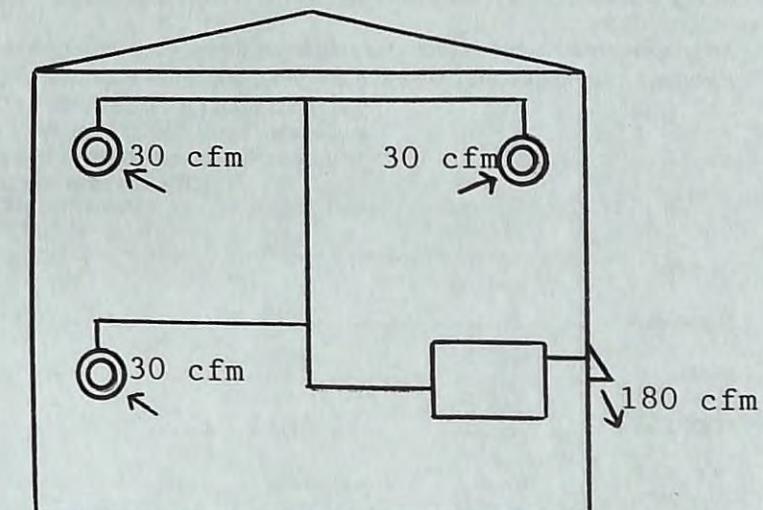
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